 **UNIVERSITY OF MAINE AT FARMINGTON**

**COLLEGE OF EDUCATION, HEALTH AND REHABILITATION**

**LESSON PLAN FORMAT**

**Teacher’s Name:**Ms. Libby **Lesson #:** 4 **Facet:** Empathy  
**Grade Level:**9th Grade **Numbers of Days:** 2 - 3 Days  
**Topic:** Linear Equations  
  
**PART I:**  
**Objectives**  
Students will understand that solutions to equations have an identity which is often developed by rewriting an expression in an equivalent form.  
Students will know identity, inequalities, equations, distributive, commutative.  
Students will be able to consider that solutions to equations have an identity which is often developed by rewriting an expression in an equivalent form.  
**Product:**iMovie  
  
**Maine Learning Results (MLR) or Common Core State Standards (CCSS) Alignment**  
**Math Common Core State Standards**  
**Content Area:** Algebra  
**Grade:** High School  
**Domain:** Reasoning with Equations and Inequalities  
**Cluster:** Solve systems of equations  
**Standard:**  
6. Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.  
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically  
**Rationale:**  
Students will meet standard seven by creating equations using real world examples and solving them using graphic organizers to synthesis their data.  
  
**Assessments**  
**Formative (Assessment for Learning)**  
**Section I – checking for understanding during instruction**  
Students will arrange themselves in the way a graph would approximately look like to better explain it to the class.  
**Section II – timely feedback for products (self, peer, teacher)**  
Students will provide feedback on how easy it was to understand their equation. The teacher will use a rubric to grade how the students used the Human Graph concept.  
  
**Summative (Assessment of Learning):**  
iMovie (75 points) Students will work in assigned groups to create a skit or song to demonstrate ways to rearrange formulas and tips to solve equations. The skit must include written text so the audience can read and hear the script. Any song must have appropriate music or no music at all and must be typed out and printed so I can make copies for the rest of the classroom. Any spoken words must be clearly understood. Student will include key words such as; Slope-intercept form, equations, inequalities, variables, and area. For each concept there must be a graph given as an example while the skit or song is playing. This way student's will have a visual to better understand that part of the skit/song.

**Integration**  
**Technology:**  
Students will be using iMovie to demonstrate how to rearrange formulas and solve equations. This will let me be creative in the way that they prove this knowledge because it can be a skit or song or anything that uses iMovie. This will help them formulate their data and have to think critically and creatively when creating the iMovie.  
**Content Areas:**  
**Art:** Students will have to be creative when formulating the iMovie.  
**Theater:** Students get to act out or sing about linear equations.  
**English**: Students will have to write a script for the skit or write the lyrics to the song they choose to sing.  
  
**Groupings**  
**Section I - Graphic Organizer & Cooperative Learning used during instruction**  
Students will use the Planning Chart to have as a guideline for their iMovie. They must prepare the movie as if the audience doesn't know how to solve the system of linear equations.  
**Section II – Groups and Roles for Product**  
Students have the choice of working either with a partner, in groups, or alone when creating the iMovie. There is no limit as to how many people they can work with as long as everyone gets a chance to be in the iMovie at least once and has an actual speaking role. This will ensure that every student participates and is engaged in the product.  
  
**Differentiated Instruction**  
**MI Strategies**  
**Verbal:** The students will be presenting through the Human Graph to the class explaining each step.  
**Logic:** The students will use the Planning Chart to write down their steps to solve the equations.  
**Visual:** Students will have to create a video for the other students in the class to be able to understand their original linear inequality.  
**Kinesthetic:** The students will be constantly moving as they explain their equation using the Human Graph.  
**Intrapersonal:** Students will be working alone while filling out the Planning Chart.  
**Interpersonal:** Students will work in groups to create the iMovie and formulate the Human Graph.  
  
**Modifications/Accommodations**  
***From IEP’s ( Individual Education Plan), 504’s, ELLIDEP (English Language Learning Instructional Delivery Education Plan)****I will review student’s IEP, 504 or ELLIDEP and make appropriate modifications and accommodations.*  
  
**Plan for accommodating absent students:**  
Students will have a Skype buddy that was assigned at the beginning of the year and they will Skype into class if a computer is available to them. Students that miss the lesson will have an absent folder with all the worksheets on linear equations that their fellow classmates have completed. Students will meet with the teacher after school and during office hours to complete the graphic organizer. This way they will have the same information as their fellow classmates. Students will still have to create the iMovie but have the chose to join an already formed group, work with a partner, or work alone. This way they still have the same options as their peers even though they were absent.   
  
**Extensions**  
**Type II technology:**  
Students will use iMovie to show how to rearrange and formulate linear equations. This will help them think critically as to what the steps are that need to be taken in order to solve the equation/rearrange it. The teacher will get to see the creative side of the students and get to see how the students interpret the concept. They students can use the graphic organizer as a guide but will have to still use their past knowledge on linear equations from other lessons in order to complete the task.  
  
**Gifted Students:**  
Gifted students will still have to create the iMovie to prove their understanding of how to rearrange equations. They will have the option to create their own equation instead of choosing one that was posed by the teacher. This way, they will have to think critically to solve their own equation.  
**Materials, Resources and Technology**  
Graphic Organizer (Planning Chart)  
Laptops  
White Board  
White Board Markers  
Graphing Paper  
Calculators  
Video Cameras  
  
**Source for Lesson Plan and Research**  
**Graphic Organizer (Planning Chart)**  
<http://www.eduplace.com/graphicorganizer/pdf/planning.pdf> - This is where the graphic organizer that will be used in the lesson is located.  
**Checking for Understanding (Human Graph)**  
<http://edu221spring11class.wikispaces.com/file/view/strategies.pdf/200849872/strategies.pdf> - This is where many of the checking for understanding strategies are located as well as the specific CFU strategy that is used in this lesson.  
**Hook (Hoop Shoot)**  
<http://www.math-play.com/slope-intercept-game.html> - This is where the hook for the beginning of class is located.  
**IMovie:**  
<http://www.apple.com/support/imovie/> - This is where students can download iMovie if they do not own a MAC computer.  
**Math Vocabulary/Definitions:** This is where all the definitions for this lesson are found.  
<http://www.crctlessons.com/math-vocabulary.html>  
<http://www.mathsisfun.com/index.htm>  
<http://www.crctlessons.com/math-vocabulary.html>  
  
**PART II:**  
**Teaching and Learning Sequence (Describe the teaching and learning process using all of the information from part I of the lesson plan)**  
  
*Classroom Arrangement:* Desks will be in groups of four all facing towards each other.  
  
**Agenda:**  
*Day One (80 minutes):*

* Hook (10 minutes)
* Attendance while students are engaged in hoop shoot
* Class discussion on Linear equations (15 minutes)
* Go over graphic organizer (15 minutes)
* Go over iMovie rubrics and presentations (30 minutes)
* iMovie set up (10 minutes)
  + Get a list of whether students will be working in pairs, groups, or alone.

*Day Two (80 minutes):*  
*Classroom Arrangement:* Desks will be in the back of the class outlining the walls. This way the room has an open floor in the middle.

* Explanation of Human Graph Concept (10 - 15 minutes)
  + Split class up into groups and explain how human graph will work
* Human Graph (40 minutes)
  + Give each group an equation that they must represent using their bodies.
  + Then give each group another equation and they must show how it changes from their original equation using their bodies.
  + Each group shows the class their human graph.
* iMovie (15 minutes - remainder of class)
  + Groups get to use the rest of class to work on their iMovie
  + They can go outside and shoot scenes if needed.

Task: Finish iMovie  
  
*Day Three (80 minutes):*

* Go over iMovie rubrics and how it will be assessed (10 minutes)
* iMovie presentations (remainder of class)

Students will understand that solutions to equations have an identity which is often developed by rewriting an expression in an equivalent form. If students ever need to build any computer system or working matrices, they will need to know the identity of each of the matrices that they are working with. *Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.*Students will enter the classroom with the teacher playing [hoop shoot.](http://www.math-play.com/slope-intercept-game.html" \t "_blank) Students will then collaborate as a class to try and beat the teacher’s scores on the slope-intercept game.  
**Where, Why , What, Hook Tailors:** *Musical, Interpersonal, Visual, Logical.*  
  
Students will know identity, inequalities, equations, distributive, commutative. **(See Content Notes)** Students will use the Planning Chart to have as a guideline for their iMovie. They must prepare the movie as if the audience doesn't know how to solve the system of linear equations. I will go over the graphic organizer with them in class. This will ensure that every student has the correct solution techniques and that they are all getting the same information. This will make it easier for them to converse and collaborate with their fellow classmates because they all have the same graphic organizer and it is filled out using the same examples. While working through the graphic organizer, I will give the students’ time to individually think and try to come up with the correct answer. This will test their actual knowledge of the content instead of me just doing the graphic organizer on the board and the students copying down what is written. It will ensure that if they do know the concept, then they can apply it. If they do not understand the concept than they can get extra help from fellow students and see the correct answer as the class goes over the examples. This will also let me know more about which students to put together for the iMovie and Human Graph. Students will arrange themselves in the way a graph would approximately look like to better explain it to the class. Students will provide feedback on how easy it was to understand their equation  
**Equip, Explore, Rethink, Tailors:** *Interpersonal, Intrapersonal, Logical, Visual, Kinesthetic.*  
  
Students will be able to consider that solutions to equations have an identity which is often developed by rewriting an expression in an equivalent form. Students will use the Planning Chart to have as a guideline for their iMovie. They must prepare the movie as if the audience doesn't know how to solve the system of linear equations. The planning chart will help the students’ synthesis their data and their thinking onto a single sheet. This will allow them to easily access their thinking for further use when creating the iMovie. The planning chart is originally for the English concentration but with a few changes, it can be used to help students understand their thinking when solving linear equations. Depending on how students do when completing the graphic organizer, will decide what groups they will be in when doing Human Graph and completing the iMovie. There will be a range of students in each group. This range will be from students that need extra instruction to students who have understood the concept and are on their way to mastery. This way the students that need extra instruction will get help from other students in their group. They will be able to apply their new knowledge to deepen their understanding on the concept. Students that already understand the concept will be able to apply their knowledge by teaching their partners. They will have to reiterate that knowledge in a way that their partners can understand and implement in the iMovie. To ensure that each student contributes to the product, I will assign roles to each student so that there is no student left out. Students will have to fill out a self- assessment when the product is finished. The self-assessment will ask each member what their contribution was and what they feel they did to help their group. They will also be asked to give a percentage of how much work they think they did if as a team the work was 100%. This will give me an idea as to if each student really did contribute and to what extent. Students will provide feedback on how easy it was to understand their equation. The teacher will use a rubric to grade how the students used the Human Graph concept.  
**Explore, Experience, Revise, Refine, Tailors:** *Kinesthetic, Musical, Interpersonal, Logical, Visual.*   
  
Students will have their peers assess the day before the presentation during the Human Graph activity. Students will self-assess after their iMovie presentation on how they think they did on the final product. Students will be given chances to finalize their product and use the peer assessment from the Human graph to fix their iMovie before the presentations the following class day. I will give feedback using a rubric on the students’ iMovie. This lesson allows the students to consider the linear equations using a different perspective. They have to actually act out and physically show the equations which will further their understanding of the concept.   
**Evaluate, Tailors:** *Logical, Kinesthetic, Interpersonal, Intrapersonal, Visual.*

**Content Notes**  
Students will know…..

* Equations
* Inequalities
* Distributive
* Commutative
* Identity

Equation:  
An equation is a mathematical sentence that indicates that two number or mathematical expressions are equal. An example of this is 3x - 4 = 19. The equal sign shows that the expression on the left side (3x- - 4) of the equation is equal to the ride side (19) of the equation.  
Inequality:  
An inequality is a mathematical sentence that compares two quantities that do not equal each other. There are a two main ways to compare quantities:  
> (Greater than)  
< (Less than)  
An example of this is 2 + 3 < 97 – 82 This is saying that 2 + 3 is less than 97 - 82  
To check that this is true, you solve both sides separately which will make this 5 < 15 which saying that 5 is less than 15 which is correct.  
Distributive Law:   
This law states that you can get the same answer when you multiply a number by a group of numbers added together, as you do when you do multiplication separately.   
Commutative Law:  
The law states that you can swap numbers around and still get the same answer when you add or multiply them.   
Identity:  
An equation which is true for every value of the variable is called an identity equation. Examples of an identity equation are; 5(*a* – 3) = 5*a* – 15 and (*a* + *b*) 2 = *a*2 + 2*ab* + *b*2  
An inequality which is true for every value of the variable is called an identity inequality. For example, the inequality *a*2 ≥ 0 is true for every value of *a*.

**Handouts**  
Planning Chart (Graphic Organizer)  
Graphing Paper  
  
**Maine Common Core Teaching Standards for Initial Teacher Certification and Rationale**  
*Standard 1 – Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.*  
  
***Learning Styles***  
***Clipboard:*** The classroom expectations are clearly posted inside the classroom and on the class wiki. These expectations cover everything that is expected of the students and the teacher. It leaves nothing to interpretation to make sure that the students are not confused. Students will be the rubrics that are clearly labeled and detailed so students know exactly what they must do to earn a proficient grade.   
***Microscope:*** There will be graphic organizers for every part of the unit. This is so students will be able to keep constant track of their thinking and also see their progress throughout the unit. They can use the graphic organizers on future projects within the unit and outside of the unit.  
***Puppy:*** Students will be seated in groups of three and working with each other on classroom activities and group projects. This is so that every student can get the necessary help from their fellow classmates in case the teacher is not readily available. Classroom expectations will be clearly posted inside the classroom.   
***Beach Ball:*** Students are given the project of making an iMovie, but they can create the movie any way they would like. They must incorporate linear equations but will get to also decide how they will create those as well. Students will be doing Human Graph which lets them be creative and show their understanding of linear equations with their bodies.  
***Rationale:***This lesson meets the standard because I know different strategies to appeal to all kind of learning styles. Students will have multiple opportunities to prove their understanding to further their knowledge in the unit. This lesson requires students to think critically in order to solve the equations but they will have the freedom to choose what equations to solve and the liberty to come up with their own equations.  
  
*Standard 6 -* *Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their on growth, to monitor learner progress, and to guide the teacher's and learner's decision making.*  
  
***Formative:***  
**Section I – checking for understanding during instruction**  
Students will arrange themselves in the way a graph would approximately look like to better explain it to the class.  
**Section II – timely feedback for products (self, peer, teacher)**  
Students will provide feedback on how easy it was to understand their equation. The teacher will use a rubric to grade how the students used the Human Graph concept.  
  
***Summative:***  
iMovie (75 points) Students will work in assigned groups to create a skit or song to demonstrate ways to rearrange formulas and tips to solve equations. The skit must include written text so the audience can read and hear the script. Any song must have appropriate music or no music at all and must be typed out and printed so I can make copies for the rest of the classroom. Any spoken words must be clearly understood. Student will include key words such as; Slope-intercept form, equations, inequalities, variables, and area. For each concept there must be a graph given as an example while the skit or song is playing. This way students will have a visual to better understand that part of the skit/song.  
***Rationale:***  
This will let me know where the students are in terms of their mastery of the concept. I will be able to use this information the future when planning other lessons and units connected to this one. There will be multiple formative and summative assessments throughout the unit so that I have a constant idea of where my students’ learning is.  
  
*Standard 7* - *Planning Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.*  
  
***Content Knowledge:***  
Students will know identity, inequalities, equations, distributive, commutative.  
  
***MLR or CCSS:***  
**Math Common Core State Standards**  
**Content Area:** Algebra  
**Grade:** High School  
**Domain:** Reasoning with Equations and Inequalities  
**Cluster:** Solve systems of equations  
**Standard:**  
6. Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.  
7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically  
***Facet:****Empathy*  
  
***Rationale:***  
Students will meet standard seven by creating equations using real world examples and solving them using graphic organizers to synthesis their data.  
  
*Standard 8 -* *Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways****.***  
  
*MI Strategies:*  
**Verbal:** The students will be presenting through the Human Graph to the class explaining each step.  
**Logic:** The students will use the Planning Chart to write down their steps to solve the equations.  
**Visual:** Students will have to create a video for the other students in the class to be able to understand their original linear inequality.  
**Kinesthetic:** The students will be constantly moving as they explain their equation using the Human Graph.  
**Intrapersonal:** Students will be working alone while filling out the Planning Chart.  
**Interpersonal:** Students will work in groups to create the iMovie and formulate the Human Graph.  
  
***Type II Technology:***  
Students will use iMovie to show how to rearrange and formulate linear equations. This will help them think critically as to what the steps are that need to be taken in order to solve the equation/rearrange it. The teacher will get to see the creative side of the students and get to see how the students interpret the concept. They students can use the graphic organizer as a guide but will have to still use their past knowledge on linear equations from other lessons in order to complete the task.  
***Rationale:***  
This lesson incorporates type II technology to further the students understanding of linear equations. This gives them a chance to prove their knowledge other than just work sheets and tests. They get to use technology in a way that they can personalize it and make it their own and give credit where credit is due.   
  
***NETS STANDARDS FOR TEACHERS***  
**1. Facilitates and Inspire Student Learning and Creativity. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.**  
a. Promote, support, and model creative and innovative thinking and inventiveness  
b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources  
c. Promote student reflection using collaborative tools to reveal and clarify students’ conceptual understanding and thinking, planning, and creative processes  
d. Model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments  
  
***Rationale:***  
Students will have to think critically when filling out the planning chart. I will be going over the graphic organizer with the class to make sure that the students have the correct answer. However, I will give students time to think on their own to see how far they are into mastering the content. The Hoop Shoot game will give the student the chance to apply their knowledge of linear equations into an interactive activity using real world applications.   
  
**2. Design and Develop Digital Age Learning Experiences and Assessments. Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop knowledge, skills, and attitudes identified in the NETS-S.**  
a. Design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity  
b. Develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress  
c. Customize and personalize learning activities to address students’ diverse learning styles, working strategies, and abilities using digital tools and resources  
d. Provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching  
  
***Rationale:***  
Students will be using iMovie to create linear equations in a creative way. This will help them think critically and use their prior knowledge to work as a team and create a movie or skit about linear equations. Students will each have an opportunity to learn according to their learning style and their multiple intelligences.